Universities as Innovation Hubs for Sustainable Development

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DANISH EDUCATION, RESEARCH AND DEVELOPMENT ASSISTANCE IN SUPPORT OF AGRICULTURE AND AGRIBUSINESS DEVELOPMENT IN AFRICA

Ministry of Science
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DANISH EDUCATION, RESEARCH AND DEVELOPMENT ASSISTANCE IN SUPPORT OF AGRICULTURE AND AGRIBUSINESS DEVELOPMENT IN AFRICA

Forum on Developing Agriculture and Agribusiness Innovation in Africa

Dar es Salaam, 12-14 May 2008

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INTRODUCTION

The "Forum on Developing Agriculture and Agribusiness Innovation in Africa" takes place at a very opportune moment. The current world food situation has accentuated the need for increasing agricultural productivity and for further developing the food industry in Africa. Technology and innovation plays an important role in this process and the need for further enhancing linkages between the private sector, the research community and other stakeholders in the development process is therefore urgent. From the Danish side we appreciate to be partners in arranging this Forum – and to have the opportunity to share experiences and further develop partnerships with the participating countries.

This publication gives a brief introduction to the Danish experience and competence within agriculture, higher education, research, and food industry innovation, followed by an introduction to Danish development policy within the area of development research and support for innovation and technology in Africa. Lastly, a collection of case-studies of projects within agriculture, higher education, research, and food industry innovation, that has been planned and implemented by Danish universities, is presented. The publication is a result of close cooperation between the Danish Ministry of Foreign Affairs, the Danish Ministry for Science, Technology and Innovation and universities in Denmark.

It is hoped that the outcome of the Forum will provide new insights and ideas that will contribute to spurring technology and innovation in the participating countries within agriculture and agribusiness development – and provide the opportunity to develop new partnerships in this sector.

1.
DANISH DEVELOPMENT ASSISTANCE, DEVELOPMENT RESEARCH AND SUPPORT FOR INNOVATION AND TECHNOLOGY IN AFRICA

Danish development assistance and support for agriculture and agribusiness development

The overriding objective of Denmark's development policy is to create lasting improvements in the living conditions of the poorest sections of the world's population through poverty reduction. The Danish development assistance thereby directly supports the achievement of the UN Millennium Development Goals aimed at halving hunger and poverty by 2015. Danish development cooperation underpins the principle of ownership and emphasises the need to build the cooperation on partner countries' own priorities, plans and budgets as the basis for aligning Danish (and other partners') aid, in line with the principles of the Paris Declaration for enhancing aid efficiency.

Danish development assistance emphasises the need for promoting broad-based and pro-poor economic growth along with support for social development. Promotion of the productive sectors has consequently been at the core of Danish development cooperation over time with focus on support to agriculture, private sector development, infrastructure etc. There is currently a renewed emphasis within national development policies on the importance of economic growth and development of the productive sectors as a prerequisite for achieving sustained poverty reduction. Denmark supports this trend fully – and sees an important role for technology and innovation in supporting the economic development in key sectors such as agriculture – including the industries and businesses around the sector.

Denmark's bilateral development assistance is focused on a selected number of developing countries, so-called programme countries, of which nine are located in Sub Saharan Africa: Benin, Burkina Faso, Mali, Ghana, Kenya, Tanzania,

Mozambique, Uganda and Zambia. Agriculture plays a central role and support for this sector is included in seven of these countries. Moreover, support for agri-business development is included in a number of business development programmes (see box 1).

In line with the commitments to enhancing aid effectiveness, the Danish bilateral programme support will in future be concentrated on a fewer number of sectors. This process is currently leading to the phasing out and in some cases merging of sectors (such as e.g. agriculture and infrastructure). Moreover, there is a tendency to merge e.g. agro-business components with business development programmes – such as the case of Tanzania.

Danish support for Development Research

Providing grants for research activity and research capacity building is part of Denmark's international development cooperation. The support for development research must contribute to achieving the key objectives of Danish development policy as they are set out in the Government's development policy. Funding of research activity and research capacity building is therefore seen as an integral part of Denmark's international development cooperation and it is an overarching goal to achieve coherence between development research, the development assistance policy and practical assistance cooperation. Support for development research includes competitive funds, funds for Danish research institutions and research networks as well as funds for international research institutions. In addition, a number of research activities are supported through sectorprogrammes.

The competitive funds are granted to major research projects and individual research projects, which aim to generate new, problem-oriented knowledge of relevance to the needs of developing countries. The projects are to build interdisciplinary research cooperation and innovative alliances between research environments, especially in the form of partnerships between Danish researchers and researchers from developing countries. Building research capacity through the cooperation between Danish institutions and partner institutions in Danida's programme countries is a key objective of the Danish research funding. The call for these funds is launched in Denmark and applicants must be associated with a Danish research institution, which on the other hand may associate researchers from the partner countries.

With a view to further strengthening the development of the research capacity based on needs in partner countries, and in order to enhance the ownership of

the research activities, two new research programmes will be piloted in 2008 in Tanzania and Vietnam. Through these pilot programmes the identification of research themes will be carried out at national level and national research institutions will identify Danish research institutions as partners in the research programmes.

Besides the research support described above, Denmark also provides funds for four international agricultural research institutions under the Consultative Group for Agricultural Research (CGIAR): IITA, ILRI, CIMMYT and ICRAF. Moreover, the research centre 'African Insect Science for Food and Health', ICIPE, is supported. Support to these institutions is provided as core funding. The establishment of research cooperation with Danish institutions is encouraged where relevant.

With regard to capacity building within Danish programme countries a new fellowship scheme is under preparation. The initiative is aimed at strengthening technological innovation in the private sector, primarily within the areas of agriculture and energy. The scheme will cover around 120 fellowships per year for short term courses in Denmark.

Future perspectives for innovation and technology

Denmark is in a process of aligning its research for development more to the needs and priorities of the developing countries. This innovative approach is accompanied by the need to adjust to new global challenges ranging from the effects of the unprecedented rises in agriculture and food commodity prices, the global terms of trade as well as effects of climate change etc. These challenges will require us to search for new innovative solutions – that are adapted to the realities on the ground.

Box 1

Danish bilateral support to agricultural development programmes in Africa	Danish bilateral support to business development programmes including agribusiness development in Africa
Benin	Ghana (in new programme)
Burkina Faso	Kenya
Kenya	Mali
Mali	Tanzania (in new programme)
Mozambique	
Tanzania[1]	
Uganda	

1 Support for the agriculture sector in Tanzania will be phased out in 2008, but a large component for agri-business will be incorporated in the business development programme.

2.
THE ROLE OF AGRICULTURE, HIGHER EDUCATION, RESEARCH AND FOOD INDUSTRY INNOVATION: THE CASE OF DENMARK

For centuries, agriculture has been the main economic activity in Denmark and farming still plays a vital role for the Danish economy. Over time the sector has undergone a transition from traditional agricultural production to intensive, highly efficient agricultural production and food manufacturing.

Parallel to this transition the productivity, value addition and total gross income has increased continuously. A considerable factor in this development has been a strong participation and involvement from farmer organisations. Also farmers' cooperatives played a key role in developing the various commodity chains.

Now, in the new millennium, Denmark is among the most efficient agricultural producers in the world. Denmark's agricultural export amounts to €8.1 billion (2007), which is 14 percent of total Danish exports. Put in other terms, Denmark, with its population of five million, has a food production that could feed a population of 30 million.

Danish farm net value added is number one in the EU. Each agricultural work unit in Denmark produces more than €50.000 worth annually, which is more than three-times as high as the EU-15-average of €15.000 per agricultural work unit. The high net value addition in Denmark is influenced by the fact that Denmark has considerable up-market export products. More than 30 percent of the agricultural export is up-market export. At the same time Denmark is leading in the EU in terms of food safety.

Why has Denmark become a world-class producer of high-end agricultural products? Part of the answer is education and research.

The agricultural sector has close linkages to the vocational and higher education systems and the educational level in the sector is very high. Extension and outreach has thus been closely linked to higher education with private sector investment in research and development.

In terms of education investments, Denmark is ranked number one in the world by OECD. Denmark invests 15 percent of its public budget in education (the OECD-average is 12.7 percent).

The Danish agricultural education system is characterised by:
- High degree of PhD-students
- Research-based learning
- Low teacher/student ratio: Denmark average 1:6
- High degree of post graduate candidates (M.Sc. level)
- Education is focused on critical thinking and problem- and project-based learning
- Internationalization of education
- Customized education programmes

In addition, the agricultural education system is part of the general higher education system in Denmark, which is based on the principles of:
- Dynamic and informal study environment
- Active learning and problem solving leading to independence
- Group and project-based work
- Wide and deep use of ICT in teaching activities

These principles produce candidates with an innovative mindset and a critical approach to the issues they are working with.

The education system is research-based, meaning that instructors and teachers have active researcher careers parallel to the teaching activities.

The Danish research system is equally world-class. By 2010 Denmark is directing one percent of its total GDP into research, which in turn will boost the total public and private investments in research to three percent of GDP. At the same time Denmark has one of highest levels of research quality – among other reflected by the fact that only one EU-country has been given more grants per inhabitant from the EU 6th Framework Programme than Denmark.

Recently a number of research institutions within the agriculture and food sector have been merged in an effort to create more research synergies, higher level of cooperation between public research and the private sector and further attract multinational funding to the research environments. This move further underlined the commitment of the Danish government to continuously improve the quality of Danish agricultural and food research.

3.
SELECTED CASES

1. Upgrading traditional African food processing targeted towards the international market
2. Selection of healthy seeds for commercial farming in Kenya
3. Selected Danish university case studies on technology transfer and innovation assessment of transgenic plants in East Africa
4. Access to private veterinary services for the poorest
5. Danida's global support to the tree seed sector (development of ideas and practises for tree seed production and distribution)
6. Income generation through market access and improved feed utilization – production of quality beef and goat meat (IGMAFU-meat)
7. Sustainable, sanitary and efficient management of animal manure for plant nutrition (SUSANE-research) – Vietnamese-Danish science transfer and training program.
8. Universities as innovation hubs for sustainable development
9. Fisheries management and governance in Southern Africa (FM-GSA)
10. Poverty alleviation through cleaner energy from agro-industries in Africa (PACEAA)
11. Livestock-wildlife diseases in East Africa: Interplay and control

CASE 1
UPGRADING TRADITIONAL AFRICAN FOOD PROCESSING TARGETED TOWARDS THE INTERNATIONAL MARKET

KEYWORDS
Capability building, innovation, value added processing accreditation, quality management

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PROJECT PERIOD
1992 - 2007

LOCATION
West Africa

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR
The background of the case at the institutional level is a combination of several DANIDA-ENRECA projects and five EU (INCO) projects with the Department of Food Science, LIFE, University of Copenhagen as the leader, which has developed a strong capability in selected West African research institutions and universities. The outcome has been in-depth scientific investigations into indigenous African foods to support their industrialization. This was targeted through upgrading of the traditional processes including appropriate unit

operations, use of starter cultures for controlled fermentation, development and application of appropriate quality and Food Safety Management Systems, transfer of technology to the local industry and provision of accredited analytical services to support the food industry and facilitate acceptance of their products on the international market. Capability building has been achieved through knowledge transfer, training of high calibre African scientists at the PhD and MSc levels as well as technicians, exchange of scientists and establishment of well equipped analytical and research laboratories. This was against a background with very little scientific knowledge of indigenous African fermented foods available although they form a substantial proportion of foods consumed in West African countries. Processing of cash crops like cocoa and coffee were also included. Export of fermented cocoa beans is the backbone of the economy of some West African countries and the region alone is responsible for 70% of total world production. Cocoa fermentation formed the basis of collaboration between the Toms Confectionary Group, Denmark and the African and Danish institutional partners as described below.

The original DANIDA-ENRECA project was initiated by the Ghana Food Research Institute and the private company Alfred Jorgensen Laboratories of Denmark. Together with the EU funded projects the collaboration showed, how European funded research and development in Africa can be used to establish joint partnerships to promote export of African value added food commodities to Europe. Through networking with researchers involved in one of the EU INCO projects, Toms Confectionary Group has invested in new equipment installed at 80 farms in Ghana to make use of some of the results generated in the project, which optimized the fermentation of cocoa. The farmers have reacted very positively and the technology is expected to spread and gain wide acceptance in Ghana as it creates better working conditions for farmers, is less time consuming, more environmentally friendly and decreases the strain on the eco-environment due to less use of plantain leaves, ensuring a more even fermentation of the cocoa beans with higher quality and potentially better prices for the farmers.

IMPLEMENTATION

The general approach to the programme involved in-depth investigation of the microbiology and biochemistry of the fermentation processes and products, including MSc and PhD studies by African and European scientists and students in mostly sandwiched programmes. Transfer of analytical procedures and techniques to the African partners, pilot studies involving the private sector and local farmers, up scaling of unit operations and establishment of pilot or model

plants supported the implementation. Important issues were development and transfer of 'Good Manufacturing Practice', GMP, and 'Hazard Analysis and Critical Control Points', HACCP, and Food Safety Management Systems based on ISO 22000 to local industry. To support export, ISO17025 was implemented and accreditation obtained in one laboratory in Ghana in 2007. Implementation in West Africa is also documented through 10 PhD thesis, 12 MSc thesis, 6 quality manuals for local industries and 45 publications in international scientific journals with double referee system, practically all with African first author. Examples of industrial implementation include soumbala production in Burkina Faso by a private partner and the Public Private Partnership with Danida, the Cocoa Research Institute of Ghana and Toms Confectionary Group. Toms together with a local trading company in 2007 has supported the introduction of the improved fermentation method for cocoa beans in selected districts of Ghana.

OBSTACLES AND FACTORS OF SUCCESS

No true obstacles were encountered. The factor that favoured the project's success was primarily a strong African network established over a period of more than 10 years involving many highly qualified Africans at all levels with direct contact to African food enterprises and authorities. Opportunities were offered to many of the African scientists to pursue PhD degrees and also publish in international journals, which they required for progress in their careers in Africa.

IMPACT

At the **local level**, the results obtained have been applied at the local production sites of the fermented foods dealt with in the project. In the case of Benin and Ghana as well as Burkina Faso, close collaboration with local producers has been established throughout the phases of the project. All partners have a strong tradition for direct collaboration with local enterprises. For example private commercial plants were assisted by the project to upgrade and modernize their facilities and implement GMP and HACCP for the production of kenkey and soumbala respectively as demonstration plants.

At the **national level** extension services, women's groups, and groups of individual producers of the various selected fermented products have been addressed. Ghana now has a food testing laboratory accredited to ISO 17025, the first in the sub-region and is facilitating the export of commodities and processed products to international markets. Burkina Faso is in the process of getting a laboratory accredited as well.
At the **African level** African biannual Regional Seminars on Fermented Foods

have been held under the aegis of this project in co-operation with other international research programmes on food science and technology. The seminars have taken place in Ghana and Benin and attracted participants from about 15 African countries.
National awareness has been created in the importance of mycotoxin contamination of foods which is facilitated by the high ambient temperatures and relative humidity in several of the African countries.
At the **international level** dissemination has been ensured by the networking and research collaboration established among the African Partners and between them and LIFE, Copenhagen University and other European universities and research institutions. The networking has included visits, exchange of scientists and seminars for presentation of results and planning of research activities.

CONCLUSIONS

The key achievements can be summarized in brief as follows:

- 45 Publications in international scientific journals with double referee system. Practically all with African first author. All partners involved.
- 4 major laboratory renovations (2 for FRI, Accra, 1 for DTA, Burkina, 1 for DNSA, Benin)
- 2 new laboratories including complete building reconstruction for UDS, in Tamale and Navrongo respectively.
- ISO 17025 fully implemented accredited at FRI, Accra, Ghana in May, 2007.
- ISO 17025 implemented at DTA in Ougdougou and Bobo-Dioulasso. Accreditation envisaged mid 2008.
- Training conducted at all levels and all partners in HACCP, GMP and GLP
- A strong network of African food scientists created through the projects and biannual series of African Regional Seminars on fermented foods initiated and held since 1992. The level of attendance has been in the order of 50 participants from close to 15 African countries.
- Established a good collection of cultures from various African fermented food with a strong potential for biotechnological exploitation.
- In both Ghana and Burkina Faso issues of food safety have gained national significance and been discussed in the public media with reference to the results of the project.

The resource of highly qualified people in Africa is immense and should be explored in research collaborations. Obviously public funding is needed both from Europe and from Africa for similar projects to materialize. The benefits of involving food industry in Africa and Europe like Toms Confectionary Group shall be mentioned, with reference to the specific case reported.

CASE 2
SELECTION OF HEALTHY SEEDS FOR COMMERCIAL FARMING IN KENYA

KEYWORDS
Seed health, Seed-borne pathogens, certification, laboratory capacity, seed supply.

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PROJECT PERIOD
1990-2007

LOCATION
Nairobi, Kenya

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR
Seed quality parameters assessed in commercial seed production include cultivar purity, ability of seeds to germinate, storability (moisture) and the absence of seed-borne diseases.
Uncontrolled distribution of infected seeds may lead to severe yield losses for farmers. However, the presence of seed-borne diseases is difficult to detect directly in seeds and farmers buying seeds have to rely on the supply system with respect to seed health. The key check point to control seed-borne diseases in commercial agriculture is to prevent infected seeds from entering the seed sup-

ply chain by rejection of infected seed lots. Rejection of heavily infected seeds may effectively be done based on visual inspection of fields during seed propagation combined by laboratory analysis of suspected seed material submitted after harvest.
In 1990 laboratory analysis of seed-borne diseases in Kenya was made mainly on imported material to avoid quarantine diseases from entering the country. The purpose of the present project was to improve seed health quality control also for seeds commercially produced within Kenya by building capacity for laboratory analysis for the national seed certification agency (now KEPHIS). This capacity should serve to back up field inspections of seed crops already made by the certification agency. An innovative element was tailor made specialist education provided by the Danish specialist centre, DSHC, to several staff members of the Kenyan seed certification agency during a period of more than 6 years terminated by joint research.

IMPLEMENTATION

From 1974-1988 frequent and sustained contact between the Danish Seed Health Centre (DSHC) and the plant quarantine authorities in Kenya was established through the participation over the years of 6 plant quarantine staff scientists in educational programmes in Denmark. Based on these contacts a mission was conducted in 1990 in order to analyze status and needs for the development of seed health control in Kenya. The mission included a detailed description of both the national quarantine agency and the national seed certification agency (today both institutions are organized as one: KEPHIS). The mission report concluded that seed health status for commercial seeds produced in Kenya would benefit from strengthening of laboratory seed testing capacity, particularly at the seed certificating agency. In the following year, 1991 a technical mission was sent from Denmark to Kenya in order to detail needs for equipment and education. A project plan was completed and the capacity enhancement project (CEP) was approved by Danida the same year. The CEP included education of 5 staff scientists and the purchase of laboratory equipment and reagents. Education and purchase of equipment was made stepwise over the period 1991 to 1997. Education was spread evenly over the years and included 3-6 months stays at DSHC in Denmark for a total of five Kenyan staff scientists. Importantly, new organisational structures were not established and only staff already permanently employed was selected for education. In the first phase (1991-1994) education and purchases needed to analyze fungal pathogens was completed. In the second phase (1994-1998) education and purchases needed for bacterial and virological seed health testing was made. In a third phase (1999-2002) joint research on the occurrence of seed borne pathogens in

various crops was performed. Research was done in collaboration between the seed certification agency, Kenya Agricultural Research Institute and DSHC. Funding of research was provided by Danida. The research resulted in the first records of seed-borne fungi found in major agricultural crops of Kenya (maize, wheat, barley, bean, cowpea – a total of 615 seed samples analyzed).
Around year 2002/2003 the project was terminated due to lack of proper accounting. The full period of implementation (1990-2002) included periods of economy slowdown (1990-1993), periods of radical governmental reforms (1994-1996), periods of severe draught (1997 and 2000) and periods of withdrawal of funds from international donors (2001-2002). All together the period was characterized by severe constraints for development in the country as a whole.

OBSTACLES AND FACTORS OF SUCCES

Factors inhibiting success of the project included overall constraints for development as mentioned above (economical stagnation, governmental cut downs and periods of agricultural crisis due to severe draught). For implementation of the specific project the high number of reagents and consumables requiring renewal after a few years appeared to be an obstacle for the successful implementation. Particularly routine analysis of seed-borne bacteria and viruses were facing problems. For analysis of the most important pathogens, seed-borne fungi, mainly microscopes and a few consumables are needed and therefore this problem was not manifest for this group of pathogens.
Factors facilitating success included education of several staff scientists from the same institution over a long period ensuring continuity and critical mass in expertise despite that some scientists moved to other institutions or were recruited for administrative positions during the project period. The research component in the third phase appeared as a strongly motivating factor for the implementation and maintenance of technology and skills.

IMPACTS

During 2005 (three years after the pull out) contact between DSHC and Kenyan partners, now KEPHIS, was renewed. A Seed Sector Country Profile for Kenya was researched and compiled by DSHC and a national symposium on seed health was arranged in Nairobi 2007. At this point of time the following sustained effects of the seed health CEP described above were identified:

1) Seed samples suspected of heavy infection were now by routine submitted for laboratory analysis at KEPHIS and a record of analysis results was made (149 samples analyzed for seed health through winter 2004/2005). Field inspection of seed crops resulted in rejection of 22% of inspected plots (sev-

eral factors in addition to seed health also playing a role) and subsequent analysis of seed samples accounted for rejection of approximately 5% of the seed lots (fungal diseases playing a major role).

2) Two scientists having received seed health education through DSHC had moved from KEPHIS to positions within university and governmental agricultural research. Due to this mobility seed health by 2007 had become a sustained part of both M.Sc. education and research in Kenya.
3) The seed health workshop in 2007 was attended by 35 people including representatives from Ministry of Agriculture, KEPHIS, agricultural research organizations, universities and seed companies. A qualified and very intense discussion unfolded at the workshop revealing a keen interest in the area from both the private and the public sector side. The workshop concluded that outsourcing of part of the inspection work from KEPHIS to private companies would counteract delays in certification and would be justified as long as KEPHIS still retained the overall responsibility for quality assurance. In addition, it was agreed that governmental research providing a robust basis for the fixing of official tolerance levels of pathogen inoculum in seed crops was highly relevant and in need.

CONCLUSION

It is concluded that the original aim of establishing capacity and some routine in seed health testing for commercial seed production in Kenya was obtained. Particularly analysis of fungal inoculum proved to be sustained in the project due to fewer requirements for reagents and consumables to be renewed compared to analysis of bacterial and viral pathogens. The obtained capacity proved sustainable for more than three years after pull out and can be expected to continue. Sustainability was obtained due to creation of a critical mass of expertise through substantial education spanning a period more than 6 years. A total number of five KEPHIS scientists were educated during the project period allowing several of these to move also to related institutions within research and education in Kenya. Manifest interaction between KEPHIS and private seed producers regarding seed health was obtained during and after the project period. A dialogue between the stakeholders on how to organize testing in the future was enhanced through the workshop 2007. The long term collaboration between scientists (south-north) should be considered as one of the most important mechanisms for maintaining and developing technical capacity and knowledge management as judged from this case.

CASE 3
SELECTED DANISH UNIVERSITY CASE STUDIES ON TECHNOLOGY TRANSFER AND INNOVATION ASSESSMENT OF TRANSGENIC PLANTS IN EAST AFRICA

KEYWORDS
Biosafety, transgenic plants, biotechnology, agricultural innovation

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PROJECT POERIOD
Phase 1: 2004-2007, Phase 2: 2007 - ongoing

LOCATION
Uganda, Kenya, Tanzania

RATIONALE AND RELEVANCE TO THE SELECTED SECTORS
Food security is a major concern for African countries. Several strategies of agricultural innovation are being tried, including the development and in-

troduction of transgenic crop plants. However, there is great uncertainty and unease about their potential impacts due to severe lack of capacity in biosafety in African countries.

The aim of the project is, together with the African partners, to build capacity in biosafety and ecological impact assessment with respect to the introduction in these countries of genetically modified plants.

The initiative for this project originated from an international project (the so-called GMO-ERA Project) where some of the Danish and African partners collaborated.

This project is relevant for agriculture because it provides the participating countries with capacity to independently evaluate new agricultural technologies. It is also relevant for the environmental and natural resource management sector, because of the resulting capacity to assess impacts of new technologies on natural resources.

IMPLEMENTATION

The main aim is being implemented through three elements: 1) by establishing biosafety training facilities, where students and relevant persons in East Africa can increase their knowledge through specialist training, 2) by improving existing standard test procedures and generating new, locally relevant knowledge and 3) by training local experts through offering PhD and MSc fellowships locally, with co-supervision offered by the Danish partners. These persons work on projects that are locally chosen and thus have local relevance.

The goals set for Phase 1 of infrastructural developments are either completed (biosafety and quarantine laboratories, Uganda, Univ. Nairobi) or approaching completion (arthropod-proof biosafety glasshouse, Kenya, biotechnology/biosafety laboratory and glasshouse, Tanzania). The first cohort of MSc students have all completed experimental work and have written/are writing their Theses. PhD students are expected to graduate in 2008. Training courses in biosafety have been developed and held for students and university employees in Tanzania (July 2007), and for the Natural Environment Management Authority personnel in Kenya (Nov 2007). Stakeholder contacts have been developed and regular information on progress is being distributed. An increasing number of stakeholders approach our project to request GM biosafety training.

OBSTACLES AND FACTORS OF SUCCESS

Technological skills and lack of experience are obstacles (for example, there are no builders with experience in building biosafety facilities in Tanzania) but they have been successfully overcome through regional collaboration and visit from Danish experts. The final factors of success are: local ownership, power of decision over the direction of the project and international recognition of achievements.

IMPACTS

At the level of farming practice, this project has not had measurable impact, because there are no transgenic crops in cultivation in the collaborating countries yet. However, an increased confidence is leading to local field tests with transgenic crops established, biosafety training courses offered to stakeholders, an increased presence of the topic in the media and an increased public awareness of this novel agricultural technology.

CONCLUSIONS

During Phase 1, 10 biosafety specialists have been trained, a biosafety training course developed, and 4 such courses have been held in four African countries. African collaborators have had input into biosafety training on the continent, as well as input into their national biosafety legislation. Four new biosafety facilities were built and a regional network of 400 stakeholders or representatives developed. There is an increasing recognition of the BiosafeTrain Project as a science-based, non-partisan project, significantly assisting the collaborating countries to make autonomous decisions on the ways and means of responsible adoption of GM and other novel agricultural technologies.

CASE 4
ACCESS TO PRIVATE VETERINARY SERVICES FOR THE POOREST

KEYWORDS
Private veterinary services, smallholders, village poultry, small livestock, rural markets, outreach, village vaccinators, Newcastle Disease, socio-economic impact, food security.

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PROJECT PERIOD
2002-2005

LOCATION
Southern Burkina Faso

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR(S)
This project is relevant to the agricultural sector as it shows that private sector based provision of veterinary services can be viable and sustainable even years after project completion. The project is innovative in its simplicity and has potential for impacting across the sub region and in the wider context of Sub Saharan Africa.

The aim of the project was to develop a business model to secured sustainable (cheap, reliable, high quality and long term) access to veterinary services for the poorest rural villagers with small livestock in Burkina Faso who had previously

been without access to veterinary services. The business model aimed to contribute to a sustainable and acceptable income for a private veterinarian located in a rural setting as this is the only way to keep highly qualified veterinarians located in rural areas. The model is sustainable, as the business has been continuously developed without subsidies for 3-4 years.

IMPLEMENTATION

The development project was managed by the district authorities in Boulgou, southern Burkina Faso. The association of private veterinarians developed the business plan in cooperation with selected private vets who in turn identified villages and poultry keepers in collaboration with the district authorities. Private veterinarians developed a business infrastructure of several (e.g. 35) village vaccinators that would be selected among the village population to make sure the vaccinators were connected to the area and knowledgeable about the locality. Village vaccinators (each responsible for 2-4 villages) would be the "extension agents" of the private vet that would not only vaccinate, but would also be creating village producer groups (self help groups) that supports each other in improving productivity through improved husbandry practices. Productivity of poultry production was enhanced and a market for vaccines developed. Producers are supported by village vaccinators who in turn are trained, served and supplied by a private veterinarian. The extension of the veterinary services into 100+ villages per private vet with direct communication linkage between veterinarian and village vaccinator and annual re-training of the vaccinators was achieved through project implementation.

The Network for Smallholder Poultry Development of Dept. of Veterinary Pathobiology, Faculty of Life Sciences at the University of Copenhagen provided a field course in poultry diseases and diagnostics to private vets. The faculty hosted students from Burkina Faso and the other developing countries enrolled in the MSc programme on Smallholder Poultry Production and Health. The MSc programme was implemented as a sandwich programme with theoretical and clinical training in Denmark combined with field investigation and research in e.g. Burkina Faso. The research carried out under the MSc programme was directly linked to the project in Burkina Faso, as the problems identified by private vets and farmers were researched.

OBSTACLES AND FACTORS OF SUCCESS

Several challenges and obstacles were encountered and overcome during the project.

1. Poverty was the problem to be addressed by the project. Poverty was also the key challenge. Poor people have limited means to invest in productive assets when basic needs as food, health and education are not covered. For good reasons, poor people need to trust that investments in productive assets are profitable and provide returns. In other words, vaccines and improved husbandry practices need to be effective for poultry keepers to accept the investment. The key factor for success is to secure a reliable supply of efficient vaccines.
2. Poor rural infrastructure and long distances result in high transactions costs.
3. Capital needed for investments is expensive with interest rate above 20% interest (flat rate) on credit.
4. Public veterinarians strongly resist policies promoting privatisation of veterinary services.
5. Price dumping of vaccine or vaccine delivery free of charge by other organisations erodes the willingness to pay for services.
6. Private veterinarians find the model less attractive than exclusively supplying services to more well off producers.

IMPACTS

The project impact includes:

1. Increased income for private veterinarians, veterinary assistants and for village vaccinators.
2. Reduced livestock mortality and morbidity rates, larger flocks and more offtake.
3. Increased income for rural livestock keepers.
4. Smoothing of income as poultry is often used as livestock banking and sold when income from other sources is low.
5. Enhanced social mobility and social inclusion of the poorest as poultry are used as gifts to village leaders and to strengthen kinship relations.
6. Increased income, mobility and social status of women.
7. Improved food security and consumption of protein and vitamins.

CONCLUSIONS

Private sector based veterinary services to the poorest rural livestock keepers can be a viable and profitable enterprise for private veterinarians. When implemented successfully, this business model offers positive impacts in terms of increased income for veterinary assistants and village vaccinators employed by the veterinarian. More importantly, sustainable private veterinary services with outreach to the poorest have considerable impact on the target population. When livestock keepers control disease burdens of their livestock, they increase

income, build their asset base, enhance household food security and improve their social status.

Conditions required for successful implementation of the business model include a) legislation and regulations providing the legal basis for the operation of private veterinarians; b) the legal basis for imports and use of relevant vaccines developed for village poultry; c) a government/local government committed to promoting private veterinary services; d) private veterinarians committed to serving the poorest. Several options have been identified for Governments, international and national NGOs, donors and development banks, pharmaceuticals, associations of private vets and other organisations to promote the upscaling of the business model and hence contribute to poverty reduction and rural development.

CASE 5
DANIDA'S GLOBAL SUPPORT TO THE TREE SEED SECTOR (DEVELOPMENT OF IDEAS AND PRACTISES FOR TREE SEED PRODUCTION AND DISTRIBUTION)

KEYWORDS

National tree seed supply, tree seed quality, tree seed distribution, tree seed sources, tree improvement, gene conservation, buildings, equipment, institutional setting, organizational setup, capacity building, training.

PARTICIPANTS/CONTACTS

Participants:
See table, column 5.
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PROJECT PERIOD

1965 – 2006.

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR

The projects were identified by the relevant national authorities, the Danish representations (Danida) and the UN representations in respective countries. The identifications were all based on a realized and not fulfilled need for quality tree seed in the collaborating country. The major objectives of the projects

were consequently to provide quality tree seed sufficient to meet the national demand (see table).
The case presents 40 years of technical support and collaboration between Danida Forest Seed Centre (merged with FLD in 2004 and with University of Copenhagen in 2007) and a number of international institutions (FAO, UNSO, UNDP, IUFRO, ICRAF, IPGRI), government institutions, NGOs and farmer groups aiming at establishing sustainable mechanisms for procurement of quality tree seed for national and international tree planting purposes.

IMPLEMENTATION

The collaboration was implemented in form of national and regional tree seed development projects, which were supported from 3 to 18 years mainly from Danida, but also from the UN-system. The sector hosting the projects in the collaborating countries were in most cases the Agriculture/Forestry and Research sectors. Most of the projects were implemented during the period 1990-2006 and the total cost of the action has been around 90 million US$. Several projects still exist as government operated institutions, whereas some have almost disappeared.

Table. Timeline of major development ideas and practises for tree seed production and distribution.

Period	Development idea	Objective	Identified limitations	Danida projects
1960s and 1970s	Breeding, gene conservation, seed production and distribution of industrial tree species by Public Agencies. Technical training	Improved reproductive material to plantation programmes to supply raw material for industry	Some programmes failed due to lack of market. Smallholders not conceived as part of the development process.	☐ Teak Improvement Centre, Thailand (TIC) 1965-1975 ☐ Pine Improvement Centre (PIC)1975-1985 ☐ Indo-Danish Tree Seed Programme 1971-1979 ☐ Malawi Tree Breeding Programme, 1970'ies ☐ Zambia Tree Breeding Programme, 1970'ies
1980s and 1990s	Seed production and distribution of multipurpose tree species, breeding and gene conservation by Public Agencies. Training, extension, technical and regulatory guidelines by the same Public Agencies.	Improved reproductive material to rural plantation programmes in support of rural household needs and small-scale agriculture.	High transaction costs. Limited penetration of the informal sector.	☐ Nicaragua Tree Improvement and Seed Centre 1983-1997 ☐ Tanzania National Tree Seed Programme 1989-2000 ☐ Nepal Tree Improvement Programme 1992-1997 ☐ National Tree Seed Centres established in Ethiopia, Sudan, Uganda, Eritrea and Laos. ☐ Indonesia Tree Seed Source Development Programme TSSDP1993-1997

Period	Development idea	Objective	Identified limitations	Danida projects
1980s and 1990s	NGO production. Shift of support from centralised to decentralised nurseries.	Improve reach to smallholders (informal sector).	Market distortion: distribution of free but inferior seed and planting material. Seed production by local growers as a business discriminated against.	☐ Nepal Tree Improvement and Silviculture Component 1998-2002 ☐ Production de semences et conservation des ressources forestières dans les terroirs villageois (PSFV), Burkina Faso 1998-2001 ☐ Indonesia Forest Seed Project (IFSP)/ICRAF Indonesia
1990s and 2000s	Privatisation of public agencies	Create financial self-reliance	Majority of smallholders does not benefit. Implementation of normative functions loses priority. Investments in breeding and gene conservation lose importance	

Period	Development idea	Objective	Identified limitations	Danida projects
1990s and 2000s	Separation of productive and normative functions.	Improve regulatory and capacity building framework	Limited impact due to too limited emphasis on support to small-size producers and seed markets in general	☐ Central America Tree Seed Project and Network 1992-2001 ☐ Indonesia Forest Seed Project (IFSP) 1998-2002 ☐ Vietnam Tree Seed Project (VTSP) 1998-2005
		Conservation of genetic resources	Separation of conservation from production in-efficient	☐ Gene conservation programme, Thailand 1990-1993 ☐ Forest Genetic Resources Conservation and Management Programme FORGENMAP, Thailand 1997-2002 ☐ Cambodia Tree Seed Project 1999-2006
2000s	Community-level seed enterprises (helped by NGOs)	Improve reach to smallholders	Insufficient demand at the individual village level to maintain a commercial seed enterprise? Retail trading networks not developed	Continuation of the NGO Production in the 1980s and 1990s

Period	Development idea	Objective	Identified limitations	Danida projects
2000s	Increasing smallholders' access to appropriate sources of tree seed through supporting development of a small scale commercial seed sector	Broader access of source seed. Support small scale commercial seed sector by reducing transaction costs in wholesale and retail seed markets; and by removing market distortions Revitalise international collaboration to promote regional breeding and conservation programmes	Requires public commitment and implementation on a relatively large scale	☐ ISSAAC Improved Seed Supply Systems for Agroforestry in African Countries 2000-2006
2000s	Millenium Villages Project	Improved reproductive material to villages in support of rural household needs and small-scale agriculture.	High transaction costs. Limited penetration of the informal sector.	

OBSTACLES AND FACTORS OF SUCCESS

Development ideas, objectives and identified limitations are summarised over time in the table above.

During the many years and many locations of implementation four major obstacles have been identified:

- Distribution of tree seed over large areas – entire countries; in particular the penetration of the informal sector to reach small holders with quality seed
- Definition and agreement of the various stakeholders role in tree seed procurement
- Development of national rules and regulations, that support tree seed procurement
- Most tree planters are not attaching monetary value to quality tree seed and markets are often distorted by free seed and seedlings without consideration of genetic quality

The role of the national tree seed centres changed along with a change in the demand from industrial tree plantations towards support to tree planting by multitudes of smallholders and it has been difficult for the centres (as well as for the donor support) to adjust to the new situation that require different logistics to reach large numbers of smallholders with a large range of species.

Public institutions (which were endowed with the knowledge and carried the responsibility for production in the early years) often had high transaction costs, which frequently led governments and donors to privatise or abandon public production of tree seed. The basic assumption behind this was that the technology was simple, and that good practise in seed supply to small farmers could be undertaken by communities and NGOs. However, this assumption has proved to be false, and the resulting widespread distribution of free but inferior seed has been detrimental to the adoption of good practise.

Despite of the obstacles most of the projects have been characterised as successful projects. They have had positive impacts on the amount of quality seed made available in the countries, a substantial capacity building took place and - probably the single most important factor - the need to consider quality seed as a natural part of sound forest management has been put high on the agenda at national level in the collaborating countries.

The case represents a good example of technology transfer to the agricultural/ forestry sector from 'north' to 'south', - it involves a number of stakeholders in the project countries from high level government to farmer groups, it has been

a large (many countries) and substantial action over a long period of time, the approach and methodology of the action has changed over time based on the experience gained and research conducted, it has been very well documented and its impact has been large.

CONCLUSIONS

The latest thinking on crop and tree seed systems, may serve to substantiate change in the currently dysfunctional tree seed systems by creating efficient input supply chains capable of reaching smallholders with good quality material. The overall objective of creating efficient input supply chains should be to improve livelihoods and cash incomes for smallholders. In this process a large degree of privatisation will be conducive for creating a demand based supply. However, privatisation should be carried out with the overall objective in mind. As it has been realised for crop seed systems, private companies will not automatically start producing and selling seed to smallholders because high transaction costs are involved in servicing poor smallholders.

Public support is therefore required in order to improve the economic environment for private sector participation and the strategies for support must be based on careful evaluation of the industry's development potential. In many cases the national tree seed centres hold an important part of the expertise to help evaluate the sector and to assist in implementation of strategies.

New models for decentralised and privately operated tree seed systems have been developed and are ready to be put into operation for the benefit of the many small holders growing trees on their private lands.

CASE 6
INCOME GENERATION THROUGH MARKET ACCESS AND IMPROVED FEED UTILIZATION – PRODUCTION OF QUALITY BEEF AND GOAT MEAT (IGMAFU-MEAT)

KEYWORDS

Quality meat, marketing, income generation, feed utilization, ruminants

PARTICIPANTS/CONTACTS

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- Web link of project: A web page is created, but only with access for participants in the project

PROJECT PERIOD

Phase 1: 1/1 2006 to 31/12 2008. Phase 2 covering the period from 1/1 2009 to 31/12 2012 has been applied for at Danida

LOCATION

Dodoma, Arusha and Dar Es Salaam regions in Tanzania, and the cattle corridor of Uganda

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR(S)

For 40 years, there has been a close collaboration between the Danish institutions and the two institutions in Tanzania and Uganda. The Danish and Tanzanian partners in this project have established a long lasting partnership and

participated for many years in ENRECA (Enhancement of Research Capacity) projects. The development of the present project is based on the high political priority of meat production in the two countries and was implemented based on a Danida supported feed lot pilot project in Tanzania and the wish of the Tanzanian scientists to support the development of this industry in Tanzania. The responsibility for the actual research plans and the implementation of the experiments take place in Tanzania and Uganda, but consultations and correspondence on plans are intensive and analysis of results, writing and publication is joint to the extent the individual researchers and students have contributed.

This project aims at contributing to development of capacity for self-reliance in Tanzania and Uganda in two ways: 1) through improvement of livestock production and 2) through human resources development. Higher revenue from livestock is achieved through cost saving by better utilization of the feed resources used to produce meat from goats and cattle and through increased benefit from production of meat with a higher market value. In both countries, there is a growing middleclass and tourist industry that demands higher quality meat than the current domestic market can produce. The result of this is that the most lucrative segment of the market relies entirely on imported meat, with no local income generation and loss of foreign currency as a result. The high and steadily growing population of ruminant animals in the countries should be able to produce meat of competitive quality. The meat produced at present derives mainly from old worn out animals or from fattening animals, which are not finished for production of a good quality carcass. Moreover, the meat is marketed "warm" without sufficient ripening and can, as a consequence, only be sold for local consumption at a low price. Increased income from the potentially important livestock sector is high on the political agenda in both Tanzania and Uganda, and Danida has lately supported a pilot project on prime beef production in Tanzania. Moreover, the Danida supported Private Agricultural Sector Support (PASS) in Tanzania has initiated the preparation of business plans and provision of loans to farmers that want to start up ranching or finishing cattle in feedlots. By combining the efforts of the PASS, with the present ENRECA (Enhancement of Research Capacity) co-operation and the support from the local governments by using there facilities as animals and land, it will be possible to achieve synergies.

IMPLEMENTATION

The project (IGMAFU-meat) will in general enhance the research capacity of the African universities by exposing staff and students to participatory research approaches, joint learning experiences with the farmers, more up to date tech-

niques and literature and an opportunity to learn from other African institutes in similar circumstances through South-South co-operation.

The development objective of the project is:
To get a sustainable increase in income of the cattle and goat keeping households in Tanzania and Uganda which is envisaged to happen through three immediate objectives

1. Increased utilization of available feed resources at ranches and feedlots
2. Increased meat production per animal
3. Increased quality of slaughter animals to international competitive level

OBSTACLES AND FACTORS OF SUCCESS

When conducting on farm meat production experiments collaboration with farmers, slaughterhouses and institutions responsible for marketing and selling the meat is vital. When it comes to the immediate objectives and especially the development objective the assumptions become numerous. The following assumptions may not be killer assumptions, but changes will further the process of achieving the development objective: The import of meat dumped from e.g. EU or other places should be regulated. Alternatives to "livestock banking" should be developed. Changes in land ownership away from only communal grazing should be developed. Social security systems should be developed and in general the farmer attitude towards commercial farming should be furthered. It is, however, believed that farmers after some time will utilize the opportunity of the growing demand and market for quality beef and goat meat to increase their income if it is biologically possible and economical feasible. The project will investigate and document the situation, and in this connection support from the local governments and donors will be appreciated, and collaboration between farmers will strongly further the process.

It is considered a success that the project has a close collaboration with the PASS (Private Agricultural Sector Support) in Tanzania. Together with 5 – 8 presentations at the TSAP/TVA meeting in November from the present project, PASS is presenting how farmers can obtain loans so they can enter into the business of producing quality beef.

Based on the fact that the Norwegian company 'Gilde Norsk Kjøtt' has shown interest in the opportunities for Uganda to produce prime beef by publishing in June 2007 a large feasibility study on "Developing an export oriented meat industry in Uganda", we consider that we are on the right track and in agreement with the wishes and opportunities seen by the private sector and the local governments.

IMPACTS

The outputs from the project are expected to be

1a. Improved knowledge of available feeds and crop by-products and their optimum use

1b. Methods for improvement of feeds and crop by-product use and digestibility

2a. Improved economy in livestock production is demonstrated (initially in meat production)

2b. Improved interests by pastoralists in selling animals for slaughter is created

3a. Methods to produce higher priced quality meat is developed

3b. The present situation and future potential is documented

4. Together with the farmers, PASS and the local governments i.e. (private –public partnership), - the situation is changed

CONCLUSIONS

There are several target groups for beef production. Overall, it is the cattle and goat keeping farmers and pastoralists, but they can only benefit if the other actors are in place and functioning. Therefore, the target group also includes the ranches and feedlots that buy, fatten and sell animals, the slaughterhouse that slaughter, mature and sell the meat and the consumers. Naturally the local scientists and service providers are key stakeholders. They have to continue the development and propose new ways when the project ends. The many stakeholders make the project complex as it requires collaboration between the pastoralists, the ranches and feed lots, the slaughter house, the marketing channels, PASS, Danida, the project staff and students and in the end the government to regulate the business.

Good progress has been made, but the IGMAFU project is only 2 years old which is very little when talking cattle production changes.

CASE 7
SUSTAINABLE, SANITARY AND EFFICIENT MANAGEMENT OF ANIMAL MANURE FOR PLANT NUTRITION (SUSANE-RESEARCH) – VIETNAMESE-DANISH SCIENCE TRANSFER AND TRAINING PROGRAM

KEYWORDS
Animal manure, sustainable, hygienically safe, environmentally friendly.

PARTICIPANTS/CONTACTS

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Principle responsible institute in Vietnam:

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Partner institutes in Vietnam:

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- Ministry of Agriculture and Rural Development, Soils and Fertilizers Research Institute (SFRI), Dong Ngae Commune –Tu Liem District Ha-Noi City Vietnam. Director Dr. Bui Huy Hien (bhhien@hn.vnn.vn).
- Web link of project: www.susane.info

PROJECT PERIOD
April 2006 - December 2009.

LOCATION
Hanoi, Vietnam.

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR(S)
SUSANE research is a whole system approach project in Vietnam with the objective to increase the fertilizer value of manure, reduce the health risks associated with manure handling and reduce the environmental pollution. All partners have learned that the management and recycling of animal manure has to be developed in a whole system approach with close collaboration between several institutes with complementary competences. The animal manure from expanding and intensive livestock production will thereby be transformed from being a source of environmental pollution and a health risk to people and animals to a raw material for energy production and fertilizer for crops. The present project was carried out in Vietnam but an international manure R&D network has been established, which partners from African R&D institutes and Universities could join. This network can initiate activities for developing locally adapted technologies to reduce environmental and health problems related to livestock and manure production, while at the same time increasing the value of manure as a fertilizer to crops and source of energy (biogas).

This project was initiated through bilateral contact between researchers at the Vietnamese applied agricultural research institute National Institute of Soil and Fertilizers and the Danish Institute of Agricultural Sciences (Now SDU) and KVL (Now – KU-Life). A decision was taken by the stakeholders to organize a fact finding workshop inviting other stakeholders in the agricultural sector, including extension service organizations and universities. The participants identified a need of competence building and development of locally adapted technologies in manure management, causing inefficient manure use and environmental and health problems.

The activity of the SUSANE, therefore, covers capacity building, R&D and adaptation of technology/management to Vietnamese farming conditions in the three activities: 1) Technology/ Management of Manure, 2) Optimizing timing and precision of manure use for efficient plant nutrient utilization and 3) Technology and management to reduce the transmission of pathogens.

Need of scientists, technicians, advisors and teachers with knowledge in this area are crucial, and in consequence the Ministry of Agriculture Research institute (NIAH) will establish a "Department of Environment". Training of PhD students provides a framework also for initiation of more long-term joint development activities, student and researcher exchange, etc. Furthermore, training of multiple PhD students from different partners in the project enables fruitful interactions and synergy effects for all partners. In the SUSANE project this was the case as PhD students within waste management from other projects and countries followed the same PhD courses.

IMPLEMENTATION

Three applied research institutes from the Ministry of Agriculture Research and Development (MARD) and two Danish Universities were involved in the project. The institutes have complementary research areas covering the whole spectre of agricultural and environmental topics related to manure management. Three PhD study programmes were included with candidates from the MARD institutes. Through a new PhD course dedicated for SUSANE training University of Aarhus and University of Aalborg were involved.

During the pre-project phase in 2004-2005, the participants visited 26 farms. The outcome of the visits was a qualitative description of manure management on farms. The work carried out in the inception phase contributed to the awareness building and to a common understanding of the manure management at the farms.

In April 2006, the project was initiated with a training workshop with all participants including three PhD students. At the workshop the three focus areas of the project were presented and discussed. Farms were visited and for each farm the PhD students interviewed farmers with the purpose of using the information for a description of management of the animals and of the animal manure.

The information collected provided knowledge needed to make a questionnaire, which was used for a baseline-survey of practices of manure handling and use of manure. This baseline survey clearly illustrated that 20% of the manure was discharged directly to rivers and ponds and that most fish ponds and fields were over-fertilized with manure. This study and information collected at the fact finding workshop set the objectives and the goals for the whole project (Published by the PhD students in a peer reviewed journal and a newsletter). Further, the information was used to identity selected practices of manure handling to be studied in the PhD programmes.

The PhD students stayed initially one year in Denmark following relevant courses and carried out research and development in the focus areas. The first year studies are now analysed and the PhD students are writing articles for peer reviewed journals and for dissemination in Vietnam. Research is at present carried out in Vietnam.

Contacts to the extension services were established at the fact finding workshop and implemented through developing a SUSANE – training project together with the extension service from Ministry of Agriculture and Rural Development. This important project will in 2008 start an initiative presenting the concept of sustainable manure management to the regional sector in the province of Dak Lak targeting the applied sector level.

OBSTACLES AND FACTORS OF SUCCESS

The success of this project is supported by the Vietnamese government having much focus on environmental issues, and the MARD institutes having identified that an efficient and hygienic safe management of manure may contribute to alleviate diseases and environmental pollution. The whole system approach has been a key to the success, and the awareness that manure management is a chain of unit operations that must be looked at as a system has proven very efficient when decisions on R&D are carried out.

The lack of collaboration between the research institutes involved has been a risk. This has till now been overcome through a continuous focus on the whole system approach. This approach is described in a conceptual model of livestock farming and manure management. Further, it is agreed that all parties shall carry out at least one of their R&D activities in one common site, a research station in the outskirts of Hanoi. An obstacle to the success is also communication between partners. This has been overcome by regular meetings and frequent internet contact (mail and voice-IP).

Language skills of local partners can be an obstacle and for the PhD students. English language proficiency is crucial for their performance and success in the international scientific research scene. Lack of proper English academic writing skills is such a risk, that priority should be given to language training. In the SUSANE project, PhD students have been offered several language courses, in oral communication as well as academic writing.

Dissemination is most important and good contacts to central actors are crucial. Project workshops with extension service and consultants have therefore

been organized and a network has been established that will contribute to an efficient presentation of the results to end users.

IMPACTS

After almost two years with activities, the R&D has already provided a knowledge base that will be used by extension services.

The R&D has contributed to increase the awareness about the risks related to livestock production. Thus, agricultural policies now include a concern about environmental problems related to agricultural production. This is reflected in the program of an international conference "13th AAAP Animal Science Congress in Hanoi", having included a session on 'Animal environment and waste management'.

At a network workshop strong links to consultant groups supporting poor mountain farmers were developed. These will be trained in the technologies through contacts and collaboration with the extension service, which will facilitate an efficient dissemination of relevant findings.

CONCLUSIONS

A most important lesson learnt is that the partners in the project need to have great focus on the pre-project phase. In this phase the specific local needs for R&D are addressed and agreed on, and partners that have complementary expertise needed to carry out the R&D are selected. Further, this phase ensures that all partners have converged to have the same picture of the agricultural system for which locally adapted technologies and management practices should be developed.

It is important that government policies acknowledge that environmental and hygienic hazards related to improper management of animal manure may greatly damage the economy and also the sustainability of small and large scale farmers. Inclusion of environmental issues in the policies and regulations will greatly facilitate a hygienic and efficient animal manure management.

CASE 8
UNIVERSITIES AS INNOVATION HUBS FOR SUSTAINABLE DEVELOPMENT

KEYWORDS
Innovation Systems, ICT, PBL, learning, sustainability, higher education, research

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- Web link of project: http://africaforum.aau.dk provides references and documentation. Other links are www.duced-iua.dk; www.sudesca.org; www.elac.dk; www.urbanquality.net

PROJECT PERIOD
1996-2008

LOCATIONS
Southern Africa, South-East Asia, Latin America, Europe

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR(S)
"Universities as Innovation Hubs for Sustainable Development" is presented as a case for purposes of impact and exemplarity. The main point is that "learning economies" rather than "knowledge economies" are keys to development and innovation (Lundvall, 2007). Universities are able to couple higher education, research, and local/regional business, both public and private. Problem-oriented and project-based learning (PBL) may support the transition towards a learning economy. Information and Communication Technology (ICT) is

prerequisite and enhances regional development, networking, and international linkages and collaboration. The Danish experience (1850-2007) demonstrates the long perspective in establishing one of the world's most competitive economies (The Economist, 2005) as well as a top ranking in Europe in terms of innovative capacity. Focus on learning and innovation and shortening of distance between higher education and society were important ingredients in this achievement. Experience and project examples from Africa, Central America and South East Asia are used here to illustrate these points.

IMPLEMENTATION

The SUDESCA project (1996-2007); a DANIDA (Danish International Development Agency) financed ENRECA (Enhancement of Research Capacity in Developing Countries) activity in Central America, facilitated new national policy and project formulations. SUDESCA set out with a research focus in a three-tiered approach and later combined this with curriculum development at master level. The first tier was about learning-by-doing-research. The second tier was individual human capacity building, e.g. enhancing the capabilities of individual researchers by scholarships, conference participation, and production of reports. The third tier was institutional capacity building, including embedding of the specific research area in the overall university strategy, financial support, legal and administrative issues in relation to contracts with external partners, research equipment, and access to library and databases.

The DUCED project 1998-2004 was a DANIDA financed university cooperation between Denmark, Southern Africa, Malaysia and Thailand. It involved implementation of new university curricula, new modes of learning as well as new project cooperation between universities and industries in the developing countries. DUCED set out with a curriculum development focus and later included research. In stage one, joint student projects paved the road for new learning and research in the South. In stage two, the South universities prepared new curricula and started introducing PBL, thereby starting developmental cooperation with local industry (external stakeholders) 'Outreach' was an important goal which was implemented through specific industry hosting of student projects as well as direct involvement of industry representatives in environmental management seminars.

As spin-offs from these two projects, new EU-financed activities emerged. Examples are the ELAC (European and Latin American Consortium for ICT Enhanced Continued Education in Environmental Management & Planning,

2004-2008) and the UQDM (Urban Quality Development & Management, 2004-2006) projects. Further activities are being planned, e.g. through the SWITCH-Asia and the ACP-EU facilities.

The ELAC project has been carried out as a demonstration project based on pilot experiments with ICT, which were later turned into institutional strategies. The UQDM project was carried out as a university-city collaboration for delivering new interdisciplinary (planning, economy and environment) learning.

OBSTACLES AND FACTORS OF SUCCESS

The vital combination of higher education and research was realized by the implementation of SUDESCA and DUCED. In both cases the most important outcomes were based on a combination of higher education and research. Ph.D. projects were essential in the research projects. The DUCED program was funded over a 5 year period and the SUDESCA was funded over a period of 11 years (out of the planned 12 year funding horizon). Some of the N-S activities continued due to personal commitment, but S-S interaction was terminated. Too short life time and lack of understanding regarding the intimate coupling between research and higher education are the most important obstacles experienced in these capacity building programs.

The success of the ELAC project was highlighted by the participants to be due to the genuine collaborative process among the Latin American and European partners, building on trust, mutual respect and shared learning. Moreover, the tangible results in terms of human resource capacity building, pedagogical development, and ICT use are indicators of success. The pilot projects were well integrated in the institutional arrangement and have been sustained in e-centres and e-learning labs after the project ended. Moreover, a joint Ph.D. program in Human Centred Informatics between Aalborg University and Universidad National, Costa Rica has been established.

IMPACTS

In the SUDESCA and DUCED projects the impacts of capacity building in HERI (Higher Education, Research and Innovation) are more knowledgeable graduates with highly relevant competences in communication, team working and project management, and enhanced innovative capabilities when employed in private firms and public organizations. Other tangible results relate to new ways of participating in the learning economies through interdisciplinary approaches and action oriented research, for example in joint ventures between companies and universities, i.e. continuing the innovative symbiosis

between education and research that was part of their own success while being students.

A learning and innovation centred approach to development is now an integrated part of the research agenda among the SUDESCA partners. At the institutional level, the administrative capability to handle international collaboration projects and organizing international workshops and conferences is improved. The learning and innovation centred approach to development has stimulated policy formulation, presentations, workshops and seminars with politicians and decision-makers, consultancy work, and filling of individual positions as decision-makers and research organizers.

The ELAC project has contributed to the development of innovative learning practices. It has the ICT strategies for universities so that they have become regional lead centres.

CONCLUSIONS

1) Higher education, research and innovation (HERI) capacity existing at universities in the North can enhance HERI capacities in the South. The collaboration has to be carefully adapted to the specific conditions in the South and build on their cultural traditions and experiences. The point is to secure generic training in the South, i.e. make universities and stakeholders able to take care of own development, research and innovation.
2) HERI capacity building in the South needs a long-term perspective to be effective. Building mutual trust, establishing research groups, including also external stakeholders, and securing adequate administrative routines takes time, which is 15 rather than 3 years.
3) Donors must think in two parallel tracks when investing in HERI in the South. In track one it is necessary to invest in a robust infrastructure that can sustain a new local "learning economy". This means binding agreements at government, university and industry levels. In the other track it is imperative to secure scholarships and other means to facilitate mobility of graduate students and young faculty in order to get abroad to build networks and take home new ideas and inspiration for HERI; without an infrastructure that enhances HERI in their home country, the scholars will not return.
4) More efficient learning seems on the agenda in all countries and PBL is one efficient tool for such development towards HERI. The partnership between industry and universities is crucial in the learning (knowledge) economy and mutually beneficial interaction is secured as an integrated part of the PBL approach.

5) ICT provides a number of new opportunities to enhance learning capabilities, to connect internationally and regionally, and to offer education to local communities. ICT has become indispensable in relation to development in general.
6) Please see http://africaforum.aau.dk for lists of publications to document the above conclusions.

CASE 9
FISHERIES MANAGEMENT AND GOVERNANCE IN SOUTHERN AFRICA (FMGSA)

KEYWORDS
Fisheries management, common pool resources, common property, natural resource management, participatory governance

PARTICIPANTS/CONTACTS

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- AQUAFISH, Zambia, Mr. Cyprian Kapasa, ckkapasa@yahoo.com;
- Center for Applied Social Sciences, University of Zimbabwe, Dr. Kefasi Nyikahadzoi, nyikah@ecoweb.co.zw;
- The World Fish Centre, Zambia, Dr. Isaac Malasha, I.Malasha@CGIAR.ORG;
- Environmental Evaluation Unit, University of Cape Town, Prof. Merle Sowman, sowman@science.uct.ac.za;
- Programme for Land and Agrarian Studies, University of the Western Cape, South Africa, Dr. Mafaniso Hara, mhara@uwc.ac.za.

Partners from completed sub-projects:

- Tanzania Fisheries Research Institute (TAFIRI)
- Fisheries Department, Zambia
- The Institute for Development of Small-scale Fisheries, Mozambique
- Web link of project: Full reference list and documentation for the cases are found at www.africaforum.aau.dk

PROJECT PERIOD
1992 to present

LOCATION
Southern Africa

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR(S)
FMGSA has contributed in a practical way by identifying the circumstances in which community-based natural resource management can be beneficial within the fisheries sector. In fisheries the approach is generally termed "fisheries co-management" because the geographical scale of the resource requires a government-community partnership. We have concluded that fisheries co-management can be an effective tool in Southern Africa when the right balance of powers and responsibilities is created. The respective roles of village leaders, traditional leaders, active fishers, government agencies and NGOs have all proven important. The benefits include the ability to incorporate both experience-based and research-based knowledge in the information needed for fisheries management.

IMPLEMENTATION
The FMGSA is actually a series of sub-projects undertaken by a more or less stable network of government agencies, African and European social scientists.

Fisheries Co-management: A Worldwide Collaborative Research Project (1994-2003)
The aim of the Danida funded "Co-management Project" was to understand the strengths and weaknesses of fisheries co-management approach and its contribution to the sustainability of fisheries resources and communities.

The Programme on the Lakes of East Africa (PLEA) (1989-1995)
The MacArthur Foundation funded PLEA carried out research on Lakes Victoria and Malawi on the anthropology and sociology of fisheries management and development, gender, environmental policy, and fisheries socio-economics. (D. Wilson carried out his dissertation under this programme).

No-man – co-man: "Management, co-management or no management? Major dilemmas in southern African freshwater fisheries" (1999-2001)
The objective of this NORAD funded research was to analyse the following questions: a) how has yields and effort developed in SADC freshwaters; b) what has been the causes behind this development; c) how does increased fish-

ing effort affect the regeneration of stocks and d) what are the management implications?

Knowledge base for fisheries management (2002-04)
This EU funded research focussed on how institutional structures and social contexts influence the quality, content and use of various forms of knowledge useful for fisheries management.

Cross-Sector Commons Governance in Southern Africa (2007-2009)
The objective of EU funded CROSCOG is to share existing research and experiences in the governance of large scale natural resource commons across different ecosystem types in Southern Africa – including marine and other large water body coastal zones; arid and semi-arid grasslands, savannas and forest patches, and floodplain ecosystems.

Understanding and Addressing Small-scale Fisheries Compliance in South Africa (2004-2008)
This is a PhD project undertaken in South Africa to address the problem of compliance and non-compliance with fisheries regulations.

OBSTACLES AND FACTORS OF SUCCESS
The case has been successful in obtaining funding partly because Danida made the ten year commitment to support the co-management project. Building capacity is a long-term process and we were allowed to organize the work with a long-term perspective.

The main obstacle was actually to retrain all the fisheries managers that had been trained in fisheries management techniques used mainly in the North, with little success even there. This knowledge was not at all applicable to managing tropical fisheries in fresh water lakes in Sub-Saharan Africa.

IMPACTS
Policy formulation
In Malawi, Mozambique and Zambia co-management has been adopted as the management tool, and their collaboration on FMGSA has been a major contribution to its design and implementation. Several active project partners, including two of our PhD students, have obtained high-rank positions within their national administration. On Lake Victoria a co-management approach has been adopted in Tanzania. The PLEA research done in conjunction with TAFIRI has been an important input into the design for related socio-eco-

nomic research under the World Bank's Lake Victoria Environmental Management Project. In South Africa and Zimbabwe, in contrast, co-management is at best a consultative process, at worst "lip service", as the issue of access rights is a major obstacle for collective action. In these countries collaboration has primarily been with academics.

Research capacity

Research capacity has increased tremendously, but based on experiences from participation in several research projects in the region there is still some way to go before partners can lead larger research projects. Several individuals have obtained higher academic degrees, e.g. 5 persons have got their PhD and two more are in process.

Research collaboration in the region

The case/projects created a "co-management" network, which has boosted regional collaboration on the subject leading to the formal creation of the African Fisheries Network initiated by African partners and driven by them.

CONCLUSIONS

Fifteen years is actually a short time for building research capacity. We have only now reached the stage where we collaborate as entirely co-equal colleagues with our African partners who have been involved since the case was initiated.

This case study clearly demonstrates that when creating innovation in Sub-Saharan Africa it is important to focus on institutional structures and realize that there is no single fix, or even a set of fixes, that can bring about sustainability.

CASE 10
POVERTY ALLEVIATION THROUGH CLEANER ENERGY FROM AGRO-INDUSTRIES IN AFRICA (PACEAA)

KEYWORDS
Rural electrification, clean energy, agro-industries, small hydro, cogeneration

PARTICIPANTS/CONTACTS
- UNEP Risoe Centre/DTU (Denmark), IED (France) and UNEP (France) as European partners,
- The East Africa Tea Trade Association (EATTA) and AFREPREN/FWD as African partners who are also sub-contractors
- The European Commission, and UNEP (GEF funds) as co-financiers
- Web link of the project: www.paceaa.org (under construction)

PROJECT PERIOD
09/2007 – 08/2010

LOCATION
Burundi, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Sudan, Swaziland, Tanzania, Uganda, Zambia.

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR(S)
Challenges of inadequate and unreliable electricity supplies for agricultural industries in rural parts of Africa have driven owners of the industries to utilize private power production. Some of the pioneers in this regard are tea and sugar industries, which have also seen the benefit of using resources at their disposal to generate renewable and environmentally-benign energy. While the tea industries have identified and started exploiting hydro-power potential within their estates, at the sugar processing factories the potential for energy cogeneration from sugar cane wastes (bagasse) is being tapped. Other types of cogeneration are also being explored from similar industries.

The amount of energy produced privately by the agro-industries is not only adequate for use by the industries but there is also an excess that can be sold to grid power suppliers, and applied towards rural electrification. The latter application is particularly important in view of the extremely low level of access to electricity in areas where the industries are located. Poverty levels are also very high partly due to lack of electric energy for socio-economic needs of the populations. However, due to policy, regulatory, financial, and other barriers the industries are not always immediately able to make this energy available to potential consumers. The main goal of the PCEAA project is to address these barriers and enable provision of energy for rural poverty alleviation.

Objectives of the project are:

a) to identify policy, commercial and regulatory barriers currently restricting the uptake of cogeneration and renewable energy systems from agro-industries, and to propose ways of overcoming these barriers
b) to develop detailed policy and regulatory guidelines and incentives for incorporation of cleaner energy from agro-industries into rural electrification programmes and plans
c) to enhance local and regional capacity of public institutions and the private sector for the effective utilisation of cogeneration and other cleaner energy systems from agro-industries in the rural electrification process.

IMPLEMENTATION

PACEAA will cooperate closely with two large initiatives from the agro-industries in East and Southern Africa, both supported by the Global Environment Facility (GEF) through UNEP. The support from GEF is justified by the potential reduction in GHG emissions resulting from substituting fossil fuel use with renewable energy. From the GEF project point of view, the activities thus focus on the electricity generation side, whereby CO2 emissions are reduced. The PACEAA project integrates with the two GEF projects but focuses on the use of electricity, and especially its potential consumption by communities surrounding and associated with the agro-industries.

The Project "Greening the Tea Industry in East Africa (GTIEA)" (http://greeningtea.unep.org/) implemented by the East Africa Tea Trade Association (EATTA) supports the development of small hydropower for the tea factories as a substitute for expensive and unreliable electricity from the grid and diesel backup power. The project "Cogen for Africa" (http://cogen.unep.org/) implemented by AFREPREN/FWD aims to help transform the cogeneration industry in Eastern and Southern Africa into a profitable cogeneration market.

Moreover, the aim is to promote widespread implementation of highly efficient cogeneration systems by removing barriers to their application through strengthening of the capacity of cogeneration project developers, technical service providers and local manufacturers, and establishing more favourable policies and institutional arrangements that support cogeneration with focus on the agro-industry.

The expected results of the PACEAA project may be grouped according to the five principal areas of activity: (i) review of policy and regulatory options for agro-industry-led and –induced rural electrification; (ii) elaboration of organisational and management models; (iii) development of local rural electrification plans; (iv) adoption of rural electrification packages; and (v) training and capacity building to support the planning and implementation of clean energy from agro-industries.

Direct outcomes are:

- A framework for the removal of policy, commercial and regulatory barriers that are currently restricting the uptake of rural electrification from cogeneration and renewable energy systems from agricultural industries in East and Southern Africa
- Detailed policy and regulatory guidelines and financial incentives for agriculture sector involvement in rural electrification for selected countries
- Completed methodology and tools for rural electrification plans for regions with agro-industries interested in cleaner energy project development
- Enhanced local, national and regional capacity for successful rural electrification development in the vicinity of cogeneration and small hydro projects led by agro-industries

OBSTACLES AND FACTORS OF SUCCESS

The complex inter-linkages between PACEAA and the two GEF projects (GTIEA and Cogen Africa) present both advantages and challenges. While GTIEA and Cogen Africa, both sponsored by GEF, are focused on generation of green energy for agro-industries (supply side), the PACEAA project clearly focuses on the use of green energy for rural electrification needs (demand side), including households, social services and small productive activities.

Cooperation between GTIEA, Cogen Africa and PACEAA will be facilitated by the fact that the main subcontractors of the PACEAA project (AFREPREN/FWD and EATTA) are the implementing agencies for GTIEA and Cogen Africa. Expertise on the supply side aspects of small-hydro and cogeneration

will be available through the consultants sub-contracted by EATTA and AFREPREN/FWD under the two UNEP/GEF projects.

Therefore, while the GEF projects focus on the generation aspects including feasibility studies for small hydro power plants and IPP contracts, PACEAA will cooperate with these initiatives by elaborating regulatory and financial models that encourage the involvement of agro-industries in rural electrification distribution through public private partnership, training target groups for the adaptation of these models to each specific context and disseminating the results to a wide group from all over the Continent.

The relationship with the GEF projects would be made difficult by the co-financing arrangements that are involved between and among the projects. On one hand there is the European Union which is financing 50% of the PACEAA action. On the other hand GEF funds are expected to finance the balance, through UNEP and the GEF projects. Differences in funding procedures between the two funding sources would take time to resolve, and therefore delays in implementing the PACEAA project would arise.

IMPACTS

Being a facilitative project, the PACEAA initiative is not expected to have any direct impacts. Indirect contributions to increased use of energy generated by agro-industries and poverty alleviation may be expected. Outcomes of the project would however be as indicated in part c above.

CONCLUSIONS

Agro-industries play a critical role in the development of rural areas in Africa and other developing countries. Provision of clean energy for use by rural populations, more use of agricultural products, and increased employment opportunities for the people arising from the industries' additional productivity, would boost rural development further. The PACEAA project is therefore expected to make a significant contribution towards socio-economic growth in poor countries of Africa. Furthermore, lessons learned from the project may be useful to developing countries that are at the same stage of development as those included in the project scope.

CASE 11
LIVESTOCK-WILDLIFE DISEASES IN EAST AFRICA: INTERPLAY AND CONTROL

KEYWORDS
Livestock; wildlife; diseases; infections; virus; foot-and-mouth disease; FMD; foot-and-mouth disease virus; FMDV; disease control; diagnosis; diagnostic capability; vaccination; genetics; virus typing; sequencing; evolutionary processes; RT-PCR; veterinary research; ELISA; serology; strain typing; epidemiology; trans-boundary animal diseases.

PARTICIPANTS/CONTACTS

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- Local coordinator, Head of Section Ademun Rose, DVM, MSc, Diagnostics and Epidemiology Center, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), P.O. Box 513, Entebbe, Uganda, E-mail: ademunrose@yahoo.co.uk

PROJECT PERIOD

1 January 2006 to 31 December 2009.

LOCATION

The project mainly takes place in Uganda, but with close contact to the Embakasi FMD Laboratory in Kenya from where one of the associated PhD-students is on leave from his position as Deputy Head. Additional contacts have been established to the FMD Laboratory in Tanzania. Laboratory activities in Uganda take place at Makerere University (MUIENR) in Kampala and at the Ministerial Laboratory at MAAIF in Entebbe while epidemiological field work and sample collection from wildlife and domestic ruminants are focused at the Lake Mburo and Queen Elizabeth National Parks and selected districts including Kasese, Bushenyi and Isingoro.

RATIONALE AND RELEVANCE TO THE SELECTED SECTOR(S)

The current project has benefited from a previous project, which focused on wildlife genetics in Africa and is like the previous project, coordinated by the University of Copenhagen and funded by DANIDA. The National Veterinary Institute, Technical University of Denmark (DTU-Vet), became involved in the new DANIDA project started in 2006, also coordinated by University of Copenhagen, with the main technical and disease-knowledge based input from Vet-DTU, to study livestock-wildlife diseases in East Africa. It was decided to initially focus on foot-and-mouth disease, as this is the livestock disease costing the most economic losses world-wide and which is present in the countries mentioned. The presence of animal diseases has a tremendous economic implication for the African countries by both causing direct losses due to disease outbreaks and by limiting marketability of domestic animal products. Consequently, unless such animal diseases can be controlled they are likely to undermine government and donor efforts geared towards poverty eradication. The project is a good example of transfer of technology and knowledge from Institutes in Denmark to East Africa and has already had considerable success transferring a number of technologies and has also had several PhD students and post docs to Denmark for specific training.

IMPLEMENTATION

The project evolved in close coordination between the coordinator and other partners in Denmark together with the involved University and Government laboratories as well as the Veterinary Services in Uganda. The main stages included defining the scope of the project, the scientific aims and the scope of technology transfer as well as the training component including training of 4 local PhD students, 4 Masters students and 1 postdoc from Uganda. When this was in place, the first step was to appoint the 4 PhD students and the postdoc required. The Masters students will be recruited in 2008. When the PhD

students and the postdoc were recruited, the project started by having them for an initial training visit in Denmark including approximately one week at the University of Copenhagen and around 2 months at DTU-Vet. After this, the students and the postdoc went back to Uganda and Kenya to do the practical parts of their studies. These studies are supported by continuous e-mail, phone and Skype contact plus a number of visits to Uganda and Kenya to help instruct and solve practical problems arising.

OBSTACLES AND FACTORS OF SUCCESS

We have not yet encountered any significant obstacles that have not been overcome. This is most likely due to the fact that we from the very early planning stage have included all relevant local partners within Makerere University and the Ugandan Veterinary Diagnostic Laboratories at the Ministry of Agriculture. We think that the factors that favour success of this project are that all of the project partners have extensive experience in such collaborative projects, including technology transfer, and that the virus diseases of livestock and wildlife studied, and hopefully at least partially controlled, are of utmost importance for the successful production and hopefully export of livestock and livestock products in the areas concerned. In other words, allowing "agricultural producers to move up the value chain in the competitive international market for agricultural exports". The project addresses important aspects of the Danida Agricultural Sector Programme Support part II (ASPS II), the Ugandan Government's "Plan for the Modernization of Agriculture" (PMA) and "The Poverty Eradication Action Plan". Within PMA, establishing an efficient livestock disease control system is an important element in the development of the livestock production system. The project is expected to give significant research enhancements in areas that contribute to controlling animal diseases in the involved African countries. Another vital factor to the success of the project is the recent decision of the Danish Veterinary Services and the DTU-Vet to strengthen research, diagnosis, training, control and advice on foot-and-mouth disease, in particular the construction of a state-of-the-art high security facility at Lindholm, Denmark, dedicated to safe handling of foot-and-mouth disease virus.

IMPACTS

In the first phase of this project, the main emphasis has been on educating PhD students, a post doc and a number of laboratory technicians. In addition, necessary basic scientific equipment has been purchased. A main goal of the collaboration is to transfer expertise to the University of Makerere, to the Ministry of Agriculture and to build up research capacity at the Ministerial

diagnostic laboratories. In a later phase, when manpower has been trained, the laboratory capacity will be further enhanced. Overall, the University scientists and the Ministerial veterinarians and laboratory staff will receive appropriate training that will allow them to supervise and optimise control of important animal diseases in East Africa.

CONCLUSIONS

The lessons learned from this case are without any doubt that all relevant partners need to be informed, involved and interested in the project for it to be successful. It is also essential to include partners with all the relevant expertise needed and to carefully plan ahead before start so that all potential conflicts of interest are properly addressed and conflicts solved before start. The described activities can relatively easily be scaled up by including more labs and countries and by expanding the number of animal diseases included.

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